1. Ovulation does not necessarily occur during each menstrual period, and
2. That menstruation is not brought about by ovulation.

The two corpora lutea seen occurred in specimens of Stage III and Stage IV; during these stages the first great increase of the blood supply to the mucosa takes place, and it therefore appears possible that the increased supply of blood to the generative organs during the early stages of menstruation may possibly induce ovulation when a sufficiently ripe ovum is present in the ovaries; there is direct proof, however, that an ovum is not dehisced at each menstrual period.

Conclusion.

Recent observations show that periods of growth and degeneration occur in the mucosa of the bitch when rutting, but denudation is not described. There is good reason to believe that the period of growth is invariably present in the mucosa of rutting animals, and, as ovulation and rut are stated to be coincident, it appears highly probable that the period of growth during menstruation represents the preparation of the mucosa for the reception and retention of an ovum, while the degeneration period represents the result of failure to fertilise the ovum or failure of ovulation.

I venture to express the belief that the function of menstruation may be thus expressed, but I fail to find any evidence of the origin of menstruation.

Note.—Since the above was written, I have seen Marshall's book on 'Vertebrate Embryology' (1893), in which he also divides the phenomena of menstruation into four stages, identical with my four Periods A, B, C, and D. The arrangement was arrived at independently.

XV. "Studies in the Morphology of Spore-producing Members. Part I. Equisetineæ and Lycopodineæ." By. F. O. Bower, D.Sc., F.R.S., Regius Professor of Botany in the University of Glasgow. Received June 9, 1893.

(Abstract.)

Two preliminary statements have already been communicated on this subject ('Roy. Soc. Proc.,' vol. 50, p. 265, and vol. 53, p. 19), dealing with some of the observations made during work extending over more than four years.

The paper which I now submit to the Society includes the detailed statement of results acquired from the Equisetineæ and Lycopodineæ.

The first pages are devoted to the discussion of points of general morphology of the sporophyte, as it is seen in archegoniate plants, together with a sketch of the history of opinion as to the morphological "dignity" of the sporangia and their relation to the parts (usually sporophylls) which bear them. The position of Goebel is adopted, that sporangia are as much organs, *sui generis*, as are shoots, roots, &c., no matter where they may be seated. It is customary to assume that the ontogeny will serve as a guide to the history of descent in plants as in animals. As applied in detail to the sporophyte generation this assumption cannot be upheld: for the conclusions drawn from wide comparison would be directly antagonistic to such a history. The young sporophyte of a Fern first forms foliage leaves, stem, and roots; only after a considerable period are sporangia produced. On the recapitulation theory it would be concluded from this that the vegetative system was the first to appear, while sporangia were of subsequent origin, and it might further be held that sporophylls are metamorphosed foliage leaves. But the whole comparative study of the sporophyte of lower forms leads to the opposite conclusion; spore-production was the first office of the sporophyte, and if the lower Bryophyta really illustrate the mode of origin of the sporophyte, the production of spores preceded the existence of a vegetative system of the sporophyte, and was apparently a constantly recurring event throughout evolution. It must, therefore, be concluded that the history of the ontogeny does not truly recapitulate the history of descent as regards the neutral generation; the sporophyte is, in fact, an intercalated phase which has acquired vegetative characters. Comparative study of the Bryophyta leads to the conclusion that the whole vegetative region was the result of progressive sterilisation of potentially sporogenous tissues.

A brief review of the progress of this sterilisation as it has already been recognised among the Bryophyta is next given; it is pointed out that (*a*) the sterilisation may involve the whole thickness of the sporophyte, as in the formation of the seta, or (*b*) it may make itself apparent only in individual cells of the sporogonial head (elaters). It is important to note that Leitgeb concluded that in certain cases the latter might be massed together to form solid tracts of sterile tissue, such as the columella of the Anthoceroteæ. But though a considerable degree of vegetative advance may be traced in the Bryophyta, and correlated with progressive sterilisation, still they are clearly marked from vascular plants by two characters: (1) the absence of appendicular organs; (2) the single continuous archesporium.

There are, at least, three possible ways in which plants with numerous separate archesporia may have originated from plants of the Bryophytic type: (i) by branching (chorisis) of a sporogonial

head; (ii) by formation of entirely new archesporia, having no direct connexion by descent from pre-existent ones; (iii) by partitioning of a continuous archesporium; this might readily result from partial sterilisation and formation of septa. It has been one chief object of this investigation to see what evidence may be gathered from Vascular Cryptogams of one or of all of these modes of origin. The question has been first approached by examination of the "strobiloid" forms.

The frequent presence of synangia in eusporangiate Vascular Cryptogams suggests either coalescence accompanying reduction in a descending series, or partitioning by means of septa in an ascending series; the first question in connexion with such synangia will be whether in any natural sequence of Vascular Cryptogams the progression from a non-septate to a septate condition can be traced; or the converse. Though the facts at hand do not amount to an actual demonstration, the Lycopodineæ and their allies are believed to be an ascending series, and they are seen to supply important evidence. The series *Phylloglossum*, *Lycopodium*, and *Selaginella*, *Lepidodendron*, and the Psilotaceæ show natural affinities. In a paper shortly to appear in the 'Annals of Botany' I have drawn attention to the remarkable anatomical similarity which links the Psilotaceæ to *Lepidodendron*, while no one would doubt the kinship of the latter to other Lycopods. To this series *Isoetes* may be added, for, though the anatomical correspondence is not so close, I think its affinities with the Lycopods are nearer than with any other family.

As regards the sporangia, there can be no doubt of the homology of the sporangium of *Phylloglossum*, *Lycopodium*, *Selaginella*, and *Lepidodendron;* similarity of position, structure, development (not traced in *Lepidodendron*), and function all show this. Within the genus *Lycopodium* differences of detail have been observed analogous to such differences as would result in the production of more bulky sporangia, such as those of *Lepidodendron* and *Isoetes*, though it is true these differences are not so extensive. In these very large sporangia trabeculæ are found, as rods or plates of sterile tissue, which may project far upwards into the sporangial cavity (*Lepidodendron*), or may extend the whole way through it to the upper wall (*Isoetes*). In the latter case it has been shown by Goebel that the trabeculæ are the result of differentiation of a potential archesporium, part of which is sterilised and forms the trabeculæ. But these are at most only partial septa.

The next step is to the Psilotaceæ; and the first question is that of the real nature of the synangium in these plants. While Goebel and Juranyi look upon the sporangiophore as an abbreviated axis bearing two leaves, the synangium occupying its apex, Graf Solms, from external observation of *Psilotum*, maintains the older view, that the whole sporangiophore is of foliar nature with two lobes, while the

synangium is a growth from its upper surface. This latter view I am able to support from evidence of sections both of *Psilotum* and *Tmesipteris.* The latter shows the synangium to originate below the apex of the sporangiophore, and from its upper surface, in a manner very similar to the sporangium of *Isoetes.* The form of the young synangium resembles that of the sporangium of *Lepidodendron,* with which genus also there is extraordinary anatomical similarity. The position so close to the apex of the sporangiophore is peculiar, but it is to be noted that there is variety among other Lycopodineæ in the position of the sporangium. The septum is similar in its origin to the sporogenous masses, and is not at first distinguishable from them; in this respect it also resembles *Isoetes.* It would thus appear that the whole synangium is comparable in origin and position, in the broad lines of development, and in function to the sporangia of other Lycopods, *that is, a septate comparable with a non-septate body.*

Misgivings which may be felt in face of such a conclusion will be in great measure removed by the results of study of certain modifications to which the synangia are liable. *Tmesipteris* appears to be a variable plant as regards the form and structure of its synangia; there is, however, some method in its irregularities; smaller synangia of simpler form and structure are found at the limits of its fertile zones, while about the middle of it synangia have been found with three loculi, corresponding to those of *Psilotum.* Examination of those of simpler form shows *that they may be only partially septate, or the septum may be absent from the first.* I have been able to prove in young synangia of this type that *the tissue which would normally form the septum may be sporogenous;* this is exactly the converse of what has been proved by Goebel in *Isoetes,* and the conclusion which may be drawn is that *there is no essential difference between the tissue which will form septum or trabeculæ and that which will form spores, since they can mutually undergo conversion.*

It has already been shown by others that in *Psilotum* the number of loculi in the synangium may vary, being sometimes two, normally three, but occasionally four or five. In *Tmesipteris* it may be one, two, or three; and as there is no doubt of the homology of these within the Psilotaceæ, we may conclude *that in homologous parts the loculi may vary in number from one upwards.*

We may recognise within the species *Tmesipteris* a correlation of size to number of loculi; the smallest specimens have no septum, and these are produced at the limits of the fertile zone, where nutrition may be failing; those which are of normal size have two loculi: occasionally, when of large size and well nourished, as at the middle of the fertile zone, the loculi may be three. Here is illustrated in one species much the same sequence as is seen elsewhere for distinct genera, such as *Lycopodium, Isoetes, Lepidodendron:* where the

sporangium is small there are neither trabeculæ nor septa, the exigencies of nutrition, and perhaps also of mechanical strengthening, not being felt (*Lycopodium*): where the sporangium is large sterile bands of tissue are present; these appear as trabeculæ or incomplete septa in *Lepidodendron* or *Isoetes*, but as complete septa in the large synangia of *Tmesipteris*. To those who accept the homology of the synangium of *Tmesipteris* with the sporangium of other Lycopodineæ the probability of this will appear specially strong. Such facts as these and their theoretical bearing are discussed at length in the memoir: the opinion is finally expressed that progressive sterilisation and formation of septa are factors which will have to be taken into account in solving the problems of origin of vascular plants, and especially of their numerous sporangia: such formation of septa will have to be considered as one factor which may help to explain the origin of the simpler vascular plants from forms of some Bryophytic character, in which the sporogenous tissue was one continuous band.

In the course of the investigation it has become apparent that *it is not possible to give any strict topographical definition of the archesporium which shall apply for all Vascular Cryptogams.* This will not surprise those who have recognised that the position of the archesporium is not fixed for all Bryophyta, while, on the other hand, the first segmentations which lead to the definition of the archesporium in Vascular Cryptogams do not correspond to those in Phanerogams, where there is a definite dermatogen.

The memoir, of which this is a brief abstract of a few of the salient points, is still incomplete: it is intended shortly to treat the spore-bearing members of the Filicineæ from a similar point of view, and in preparation for this a considerable number of observations have already been made. In the meanwhile, it may be stated that the main lines of argument pursued above in treating the strobiloid forms will be found to be applicable also for the Filicineæ. The second part will also include a general discussion of the whole subject.

XVI. "On *Megaladapis madagascariensis*, an Extinct Gigantic Lemuroid from Madagascar." By C. J. Forsyth Major, M.D., For. Cor. Zool. Soc. Lond., &c. Communicated by Dr. H. Woodward, F.R.S., V.P.G.S., &c. Received June 14, 1893.

(Abstract.)

The subject of the present paper is a somewhat imperfect Mammalian skull, together with a right and left mandibular ramus, apparently belonging to the same specimen, discovered by Mr. J. T. Last (collector for the Hon. Lionel Walter de Rothschild), in a